(11)Publication number : 03-024532

(43)Date of publication of application : 01.02.1991

(51)Int.CI. G03B 21/16 G03B 21/132 G03B 27/54 G09F 9/00

G09F 9/00 H01J 61/52 H04N 5/74

(21)Application number : 01-158918 (22)Date of filing : 21.06.1989

(71)Applicant : SEIKO EPSON CORP (72)Inventor : KARASAWA JIYOUJI

(54) ILLUMINATOR

SPECIFICATION

1. Title of the Invention

ILLUMINATION DEVICE

2. Claim

An illumination device comprising:

a light source configured of a metal halide lamp and a lamp reflector;

holding means for said light source;

a lamp housing for storing said light source and said holding means; and

cooling means for cooling said light source;

wherein a rectifying structure is disposed on a wall face of said lamp housing, with said rectifying structure and said metal halide lamp and said cooling means arrayed in a straight line.

3. Detailed Description of the Invention

[Technical Field of the Invention]

The present invention relates to an illumination device used for overhead projectors, liquid crystal color projectors, and the like.

[Description of the Related Art]

Conventionally, storing a light source made up of a metal halide lamp and lamp reflector in a lamp housing of sheet metal or the like by holding means, providing an air intake hole and air exhaust hole in a wall of the lamp housing, and connecting with cooling means by a duct or

the like, as been a common arrangement.

[Problems to be Solved by the Invention]

Metal halide lamps used in overhead projectors and liquid crystal color projectors are preferably cooled locally at the light-emitting side sealed portion in order to extend the life thereof and improve optical properties, and stable cooling is necessary since the cooling conditions greatly contribute to the optical properties thereof. However, with conventional illumination devices, air within the lamp housing easily turns turbulent so local and stable cooling of the light-emitting side sealed portion is difficult, which accordingly greatly affects the color and brightness of projected images from the overhead projector or liquid crystal color projector. Also, desired cooling efficiency is not readily obtained, so there is the possibility of the quartz or molybdenum foil making up the metal halide lamp cracking, a situation which could lead to leaking or bursting of the metal halide (a metal halide) within the metal halide lamp.

The illumination device according to the present invention has been made to solve the above problems, and accordingly it is an object thereof to provide an illumination device capable of improving optical properties such as color and brightness of projected images from overhead projectors and liquid crystal color projectors in a sable manner, and improve the safety and extend the life of metal halide lamps.

[Means for Solving the Problems]

To solve the above problems, the illumination device according to the present invention comprises a light source configured of a metal halide lamp and a lamp reflector, holding means for the light source, a lamp housing for storing the light source and the holding means, and cooling means for cooling the light source, wherein a rectifying structure is disposed on a wall face of the lamp housing, with the rectifying structure and the metal halide lamp and the cooling means arrayed in a straight line.

[Operation]

With the illumination device of the configuration described above, the air flowing due to the cooling means is rectified by the rectifying structure disposed on the wall face of the lamp housing, then locally cools the light-emitting side sealed portion of the metal halide lamp, and is externally exhausted from the lamp housing.

[Embodiments]

An embodiment of the present invention will be described with reference to the drawings. Fig. 1 is a configuration diagram of the present invention. A light source 3 made up of a metal halide lamp 1 and a lamp reflector 2 is stored in a lamp housing 5 by holding means 4. The metal halide lamp 1 performs discharge lighting by potential being applied to the electrodes thereof from a lamp electric power source 6 disposed outside the lamp housing 5. The holding means 4 has a structure dividing the interior of the lamp housing 5 into two, with a rectifying structure 8 disposed on a side wall of a space 7 at the side

of the space divided in two by the holding means 4 where the light-emitting side sealed portion is situated. An air exhaust hole is provided to a side wall at the opposite side from the rectifying structure 8 across the metal halide lamp 1, and a cooling means 9 such as an axial fan or the like is provided adjacent to the hole. In this structure, when the cooling means 9 is rotated, air subjected to rectified suction from the rectifying structure 8 becomes a laminar flow, takes the heat from the light-emitting side sealed portion of the metal halide lamp 1, and is exhausted externally from the cooling means 9 by the air exhaust hole provided in the side wall of the lamp housing 5 (arrow in Fig. 1). Conceivable embodiments of the rectifying structure 8 include a divided plate structure 8(a) such as shown in Fig. 2 and a honeycomb structure 8(b) such as shown in Fig. 3. Fig. 2 and Fig. 3 are side views along arrow A in Fig. 1, wherein in the event that the rectifying structure 8 is made to be equivalent to the size of the light-emitting side sealed portion of the metal halide lamp 1 as shown in the figure, is and disposed on a straight line connecting the cooling means and the light-emitting side sealed portion of the metal halide lamp 1 with a certain amount of depth, the desired local cooling can be realized in a stable manner, and giving an appropriate amount of depth means that this can also serve to shield unwanted light from the metal halide lamp 1 to the lamp electric power source 6 side. As long as the positional relation of the rectifying structure 8 and the light-emitting side sealed portion 17 of the metal halide lamp 1 and the cooling means 9 are in a straight line, the same advantages can be obtained regardless

of whether horizontal, vertical, or diagonal.

Fig. 4 is a schematic cross-sectional view of the light source 3 made up of the metal halide lamp 1 and the lamp reflector 2. The metal halide lamp 1 has a structure of electrodes formed of a tungsten rod 10 and molybdenum foil 11 being sealed with quartz glass 12, with metal halide such as indium, zinc, scandium, neodymium, etc. (metal halides), in a mercury base, sealed in a hollow portion 13 within the quartz glass 12, wherein the brightness and color of the illumination light is determined by the absolute volume of mercury vapor and metal halide vapor at the time of lighting and the mixture ratio thereof. The metal halide lamp 1 has one sealed portion 14 thereof fixed to a lamp fixing portion 15 of the lamp reflector 2 by cement 16 or the like, thereby making up a light source 3. With the above structure, lighting the metal halide lamp 1 causes the light-emitting side sealed portion 17 of the metal halide lamp 1 to be heated by the direct light 18 from the light-emitting portion of the metal halide lamp 1 and the reflected light 19 from the lamp reflector 2, so the light-emitting side sealed portion 17 becomes extremely hot and the entire metal halide lamp 1 becomes hot as well. The light emitting spectrum of the hot metal halide lamp 1 is as shown in Fig. 5, with an increase in the metal halide light emission spectral components 21 as to the mercury light emission spectral components 20 and the mercury light emission spectral components 20 become inconspicuous, so the color temperature of the illumination light decreases and brightness increases. Conversely, the light emitting structure of the metal halide lamp 1 cooled by the

structure according to the present invention as shown in Fig. 1 is as shown in Fig. 6, wherein the decrease in the metal halide light emission spectral components 21 emphasizes the mercury light emission spectral components 20 so the color temperature of the illumination light increases and brightness decreases. Taking the relation between the cooling conditions and the color temperature and brightness of the illumination light and making an expression wherein the cooling conditions are substituted with lamp discharge current has been shown by experimentation to yield the results shown in Fig. 7, and accordingly it can be seen that the cooling conditions greatly contribute to optical properties such as color temperature and brightness. Accordingly, cooling the light-emitting side sealed portion 17 of the metal halide lamp 1 in a stable manner is extremely important in the obtaining of stable optical properties.

Also, the sealed portions 14 and 17 at either side are of a structure with tungsten rod 10 and molybdenum foil 16 enveloped in quartz glass 12 and accordingly crack easily under heat, and particularly the light-emitting side sealed portion 17 is exposed to high temperatures, so locally cooling this portion in a stable manner is extremely important in securing safety and longevity of the metal halide lamp.

[Advantages]

As described above, the illumination device according to the present invention has a structure of a rectifying structure disposed on a side wall of the lamp housing storing the metal halide lamp, with the

rectifying structure and the light-emitting side sealed portion of the metal halide lamp and the cooling means arrayed in a straight line, so the air in the lamp housing becomes a laminar flow capable of local cooling of the light-emitting side sealed portion of the metal halide lamp in a stable manner, and the color temperature and brightness of the illumination light can be maintained in a stable manner, thereby improving the optical properties such as color and brightness of projected images from overhead projectors or liquid crystal color projectors, and improving the safety thereof and extending the life thereof.

4. Brief Description of the Drawings

Fig. 1 is a configuration diagram of the present invention, Fig. 2 is a side view illustrating the rectifying structure according to the present invention, Fig. 3 is a side view illustrating another rectifying structure according to the present invention, Fig. 4 is a schematic cross-sectional view of a light source using a metal halide lamp, Fig. 5 is a spectrum diagram of light emission from a metal halide lamp in an uncooled state, Fig. 6 is a spectrum diagram of light emission from a metal halide lamp in a cooled state according to the present invention, and Fig. 7 is a relational diagram of the color temperature and brightness of lamp discharge current.

1 ... Metal halide lamp

2 ... Lamp reflector

3 ... Light source

4 ... Holding means

5 ... Lamp house

6 ... Lamp electrical power source

8 ... Rectifying structure

9 ... Cooling means

10 ... Tungsten rod

11 ... Molybdenum foil

12 ... Quartz glass

20 ... Spectral components of mercury light emission

21 ... Spectral components of metal halide light emission

FIG. 5

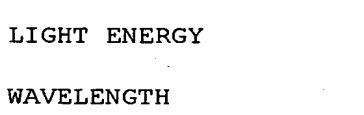


FIG. 6

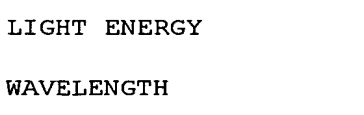
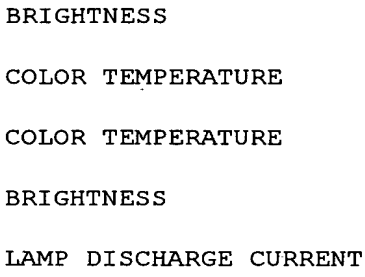


FIG. 7



Amendments

1. Correct the Title of the Invention so as to read "ILLUMINATION DEVICE AND PROJECTOR".

2. Correct the Claims according to sheet attached separately.

3. Correct page 3 lines 12 through 19 of the Specification so as to read as follows:

"The illumination device according to the present invention firstly comprises a light source configured of a metal halide lamp and a lamp reflector, a lamp housing for storing the light source, and cooling means for cooling the light source,

wherein a rectifying structure unit is disposed on a wall face of the lamp housing, with air flowing into the lamp housing through the rectifying structure unit being exhausted from the cooling means.

Secondly, the rectifying structure unit is positioned on a straight line connecting a light-emitting side sealed portion of the metal halide lamp and the cooling means.

Thirdly, the illumination device is used as a light source of a projector for projecting images."

4. Correct page 8 lines 12 through 14 of the Specification reading "has a rectifying structure ... in a straight line" so as to read "has a rectifying structure disposed on a side wall of the lamp housing storing

the metal halide lamp".

Claims

(1) An illumination device comprising:

a light source configured of a metal halide lamp and a lamp reflector;

a lamp housing for storing said light source; and

cooling means for cooling said light source;

wherein a rectifying structure unit is disposed on a wall face of said lamp housing, with air flowing into said lamp housing through said rectifying structure unit being exhausted from said cooling means.

(2) An illumination device according to Claim 1, wherein said rectifying structure unit is positioned on a straight line connecting a light-emitting side sealed portion of said metal halide lamp and said cooling means.

(3) A projector, using the illumination device according to either Claim 1 or 2 as a light source for projecting images.